

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00804

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B02C 7/00, D21D 1/30

According to International Patent Classification (IPC) and International classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B02C, D21B, D21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| A | SE 441758 B (SUNDS DEFIBRATOR AB), 4 November 1985 (04.11.85), page 1, line 36 - page 2, line 11, figure 1 -- | 1,8 |
| A | EP 0931584 A1 (VOITH SULZER PAPIERTECHNIK PATENT GMBH), 28 July 1999 (28.07.99), column 3, line 5 - line 37, figure 1 -- ----- | 1,8 |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

27 December 2000

Date of mailing of the international search report

09-01-2001

Name and mailing address of the ISA:
 Swedish Patent Office
 Box 5055, S-102 42 STOCKHOLM
 Facsimile No. +46 8 666 02 86

Authorized officer

Wiva Asplund/ELY
 Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

04/12/00

International application No.
PCT/FI 00/00804

| Patent document cited in search report | | | Publication date | Patent family member(s) | | Publication date |
|---|---------|----|---------------------|----------------------------|------------|---------------------|
| SE | 441758 | B | 04/11/85 | AU | 3934985 A | 01/11/85 |
| | | | | DE | 207937 T | 30/04/87 |
| | | | | EP | 0207937 A | 14/01/87 |
| | | | | FI | 863998 A | 02/10/86 |
| | | | | JP | 61501715 T | 14/08/86 |
| | | | | NO | 854832 A | 02/12/85 |
| | | | | NZ | 211324 A | 11/07/86 |
| | | | | SE | 8401846 D | 00/00/00 |
| | | | | WO | 8504433 A | 10/10/85 |
| <hr/> | | | | | | |
| EP | 0931584 | A1 | 28/07/99 | DE | 19802260 A | 29/07/99 |
| <hr/> | | | | | | |

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| | | |
|---|---|---|
| Applicant's or agent's file reference BP100192/MAK/PKK | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/FI00/00804 | International filing date (<i>day/month/year</i>) 21.09.2000 | Priority date (<i>day/month/year</i>) 21.09.1999 |
| International Patent Classification (IPC) or national classification and IPC ₇ B 02 C 7/00, D 21 D 1/30 | | |
| Applicant VALMET MECHANICAL PULPING OY et al | | |

| |
|---|
| 1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36. |
| 2. This REPORT consists of a total of <u>4</u> sheets, including this cover sheet. <input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of _____ sheets. |
| 3. This report contains indications relating to the following items: I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application |

| | |
|--|--|
| Date of submission of the demand 19.04.2001 | Date of completion of this report 04.09.2001 |
| Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88 | Authorized officer Wiva Asplund/ELY Telephone No. 08-782 25 00 |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00804

I. Basis of the report

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed
- ☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

| | | | |
|-------------------------------|--------|-------------|-----|
| Novelty (N) | Claims | <u>1-12</u> | YES |
| | Claims | | NO |
| Inventive step (IS) | Claims | <u>1-12</u> | YES |
| | Claims | | NO |
| Industrial applicability (IA) | Claims | <u>1-12</u> | YES |
| | Claims | | NO |

2. Citations and explanations (Rule 70.7)

The documents cited in the International Search Report represent the prior art. The claimed invention stated in claims 1-12 is not considered to be anticipated by these documents. None of the documents or any relevant combination of them reveal a method or a device for dispersing pulp with a running wheel acting as pump arranged at the outlet end of a narrow opening between conical surfaces, where the dispersing event takes place as described by these claims.

According to the arguments stated above, the invention claimed in claim 1-12 is novel, considered to involve an inventive step and have industrial applicability.

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

| | |
|---|---|
| Date of mailing (day/month/year) 23 May 2001 (23.05.01) | |
| International application No. PCT/FI00/00804 | Applicant's or agent's file reference BP100192 |
| International filing date (day/month/year) 21 September 2000 (21.09.00) | Priority date (day/month/year) 21 September 1999 (21.09.99) |
| Applicant KANKAANPÄÄ, Veikko | |

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 19 April 2001 (19.04.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

| | |
|--|---|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35 | Authorized officer Claudio Borton Telephone No.: (41-22) 338.83.38 |
|--|---|

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF THE RECORDING
OF A CHANGE(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

| | |
|--|--|
| Date of mailing (day/month/year) 18 février 2002 (18.02.02) | IMPORTANT NOTIFICATION |
| Applicant's or agent's file reference BP100192 | |
| International application No. PCT/FI00/00804 | International filing date (day/month/year) 21 septembre 2000 (21.09.00) |

1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

| | | |
|--|----------------------------|--------------------------|
| Name and Address VALMET MECHANICAL PULPING OY P.O. Box 125 FIN-37601 Valkeakoski Finland | State of Nationality FI | State of Residence FI |
| | Telephone No. | |
| | Facsimile No. | |
| | Teleprinter No. | |

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

| | | |
|--|----------------------------|--------------------------|
| Name and Address METSO PAPER, INC. Fabianinkatu 9 A FIN-00130 Helsinki Finland | State of Nationality FI | State of Residence FI |
| | Telephone No. | |
| | Facsimile No. | |
| | Teleprinter No. | |

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

| | |
|--|---|
| <input checked="" type="checkbox"/> the receiving Office | <input type="checkbox"/> the designated Offices concerned |
| <input type="checkbox"/> the International Searching Authority | <input checked="" type="checkbox"/> the elected Offices concerned |
| <input type="checkbox"/> the International Preliminary Examining Authority | <input type="checkbox"/> other: |

| | |
|---|---|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland | Authorized officer Anne KARKACHI |
| Facsimile No.: (41-22) 740.14.35 | Telephone No.: (41-22) 338.83.38 |

RECORD COPY

PCT REQUEST

1/4

BP100192

Original (for SUBMISSION) - printed on 21.09.2000 12:17:54 PM

| | | |
|--|--|---|
| 0 0-1 | For receiving Office use only International Application No. | PCT/FI 93 / 0988 |
| 0-2 | International Filing Date | 21 SEP 2000 (21-09-2000) |
| 0-3 | Name of receiving Office and "PCT International Application" | The Finnish Patent Office PCT International Application |
| 0-4 0-4-1 | Form - PCT/RO/101 PCT Request Prepared using | PCT-EASY Version 2.91 (updated 01.07.2000) |
| 0-5 | Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty | |
| 0-6 | Receiving Office (specified by the applicant) | National Board of Patents and Registration (Finland) (RO/FI) |
| 0-7 | Applicant's or agent's file reference | BP100192 |
| I | Title of invention | METHOD AND DEVICE FOR PROCESSING PULP |
| II II-1 II-2 II-4 II-5 | Applicant This person is: Applicant for Name Address: | applicant only all designated States except US VALMET MECHANICAL PULPING OY P.O. Box 125 FIN-37601 Valkeakoski Finland |
| II-6 | State of nationality | FI |
| II-7 | State of residence | FI |
| III-1 III-1-1 III-1-2 III-1-4 III-1-5 | Applicant and/or inventor This person is: Applicant for Name (LAST, First) Address: | applicant and inventor US only KANKAANPÄÄ, Veikko Rengastie 24 B FIN-37600 Valkeakoski Finland |
| III-1-6 | State of nationality | FI |
| III-1-7 | State of residence | FI |

PCT REQUEST

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| | | |
|--------|---|--|
| IV-1 | Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: | agent |
| IV-1-1 | Name | BERGGREN OY AB |
| IV-1-2 | Address: | P.O. Box 16 FIN-00101 Helsinki Finland |
| IV-1-3 | Telephone No. | +358-9-693701 |
| IV-1-4 | Facsimile No. | +358-9-6933944 |
| IV-1-5 | e-mail | email.box@berggren.fi |
| V | Designation of States | |
| V-1 | Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned) | AP: GH GM KE LS MW MZ SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT |
| V-2 | National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned) | AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH&LI CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW |
| V-5 | Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. | |
| V-6 | Exclusion(s) from precautionary designations | NONE |

PCT REQUEST

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| | | | |
|--------------|---|--|-----------------------------|
| VI-1 | Priority claim of earlier national application | | |
| VI-1-1 | Filing date | 21 September 1999 (21.09.1999) | |
| VI-1-2 | Number | 19992010 | |
| VI-1-3 | Country | FI | |
| VI-2 | Priority document request | | |
| | The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): | VI-1 | |
| VII-1 | International Searching Authority Chosen | Swedish Patent Office (ISA/SE) | |
| VIII | Check list | number of sheets | electronic file(s) attached |
| VIII-1 | Request | 4 | - |
| VIII-2 | Description | 5 | - |
| VIII-3 | Claims | 2 | - |
| VIII-4 | Abstract | 1 | bp100192.txt |
| VIII-5 | Drawings | 1 | - |
| VIII-7 | TOTAL | 13 | |
| | Accompanying items | paper document(s) attached | electronic file(s) attached |
| VIII-8 | Fee calculation sheet | ✓ | - |
| VIII-9 | Separate signed power of attorney | ✓ | - |
| VIII-16 | PCT-EASY diskette | - | diskette |
| VIII-17 | Other (specified): | Copy of Official Action in FI 19992010 | - |
| VIII-18 | Figure of the drawings which should accompany the abstract | 1 | |
| VIII-19 | Language of filing of the international application | Finnish | |
| IX-1 | Signature of applicant or agent |  | |
| IX-1-1 | Name | BERGGREN OY AB | |
| IX-1-2 | Name of signatory | Juhani Kupiainen | |
| IX-1-3 | Capacity | Patent Attorney | |

FOR RECEIVING OFFICE USE ONLY

| | | | |
|-------------|--|--------------------|---------------------|
| 10-1 | Date of actual receipt of the purported international application | 21 SEP 2000 | (21-09-2000) |
| 10-2 | Drawings: | | |
| 10-2-1 | Received | | |
| 10-2-2 | Not received | | |
| 10-3 | Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application | | |
| 10-4 | Date of timely receipt of the required corrections under PCT Article 11(2) | | |
| 10-5 | International Searching Authority | ISA/SE | |
| 10-6 | Transmittal of search copy delayed until search fee is paid | | |

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| | | | |
|------|---|------------------|-----------------|
| 11-1 | Date of receipt of the record copy by the International Bureau | 0 6 OCTOBER 2000 | . 6 6. 10. 00) |
|------|---|------------------|-----------------|

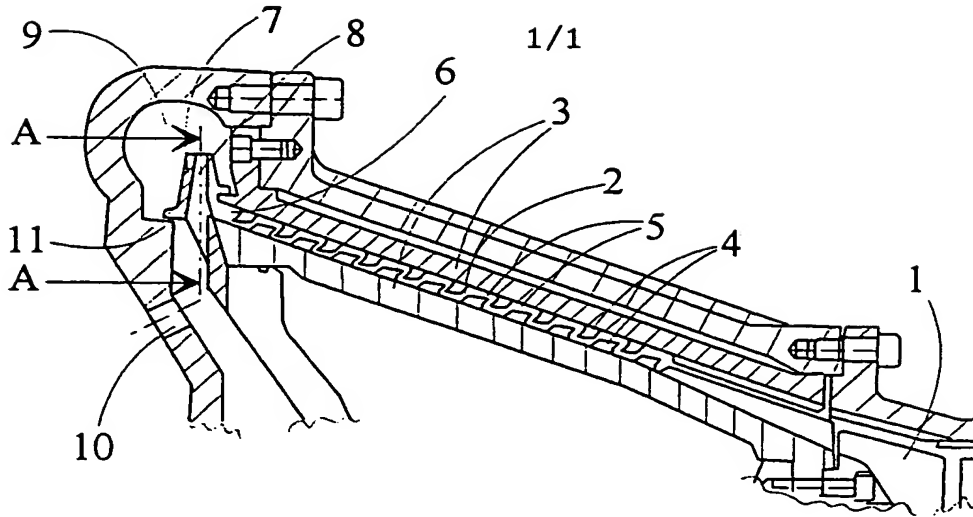


Fig.1

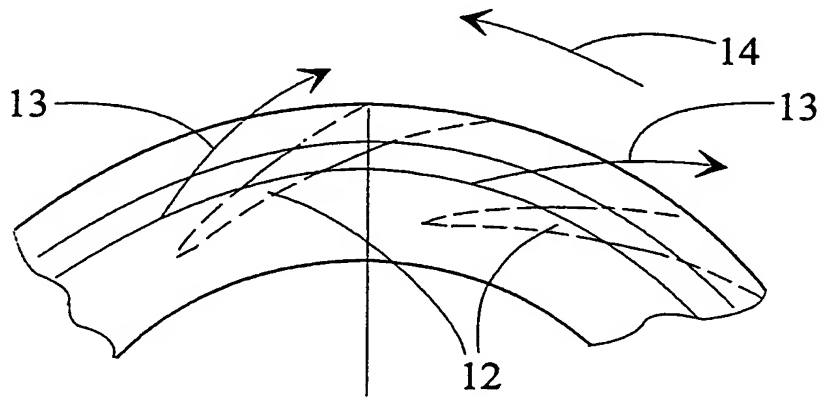


Fig.2

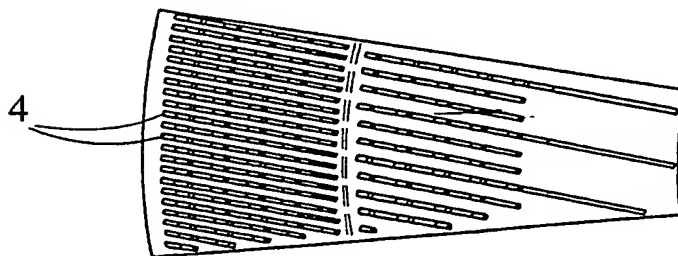


Fig. 3

Menetelmä ja laite puukuitumassan käsittelemiseksi

- 5 Tämän keksinnön kohteena on menetelmä puukuitumassan, etenkin jäte- tai keräyspaperia sisältävän massan, joka sisältää kiintoaineksen ja nestefaasin, dispergoimiseksi, jossa hienonnettu massa syötetään toistensa suhteen pyörimisliikkeeseen saatettujen dispergaattorin teräpintojen väliin. Keksinnön kohteena on myös dispergaattori mainitun menetelmän soveltamiseksi.
- 10 Puukuitumassaa käsitellään dispergaattorissa, jossa massan epäpuhtaudet erottuvat kuiduista, kuitujen kuitenkin vaurioitumatta käsittelyssä. Tämä on mahdollista dispergaattorin keskinäisesti vastakkaisten terillä varustettujen teräpintojen avulla, joista toinen teräpinta alustoineen (staattori) on kiinteä ja toinen teräpinta alustoineen (roottori) pyörii toisen suhteen. Terät ja niiden väliin jäävät raot saavat aikaan
- 15 massan edestakaisen liikkeen dispergaattorissa, jolloin epäpuhtauksien erottuminen kuiduista tapahtuu. Dispergoinnin tarkoituksena on tavallisesti mekaanisesti irrottaa epäpuhtaudet kuiduista ja samalla jauhaa epäpuhtaudet pienemmiksi partikkeleiksi vaikuttamatta kuitenkin negatiivisesti kuitujen ominaisuuksiin.
- 20 Dispergaattori sopii erityisesti mustepartikkeleja tai epäpuhtauksia, kuten liimoja ja sulapinnoitteita, sisältävän jäte- tai keräyspaperia sisältävän massan käsittelemiseen. Tällaisen massan käsittelyyn tarkoitettu menetelmä ja hajotin on esitetty SE-patenttijulkaisussa 502 906. Julkaisussa esitetään jauhuselementti, joka koostuu kahdesta vastakkaisesta jauhinkiekosta, jotka on varustettu kohohammaskuvioilla.
- 25 Kaltevat kohokuviot on sijoitettu kiekkoille säteensuuntaisesti.
- Tasomaisten dispergaattoreiden lisäksi voidaan käyttää kartiomallisia dispergaattoreita. Kartiodispergaattoreiden ongelmana on kuitenkin niiden suoma vähäinen massan siirtovoima. Tästä johtuen kun poistokammion paine on suuri, eli hammastusten välisessä raossa työntövoima on suuri, työstöpintojen säätö vaikeutuu ja dispergaattorin kuormitus lisääntyy. Dispergaattori voi jopa tukkeutua, jolloin prosessi keskeytyy. Tämä ongelma vältetään käyttämällä keksinnön mukaista menetelmää.
- 30 Keksinnön kohteena olevassa menetelmässä puukuitumassan, etenkin jäte- tai keräyspaperia sisältävän massan, dispergointi tapahtuu kartiopintojen välisessä teräraossa, jonka poistopäähän on järjestetty pumppuna toimiva juoksupyörä, jolla massa pumpataan keskipakovoiman avulla dispergaattorista ulos.

Keksinnön mukaisessa menetelmässä käytetään kartiodispergaattoria, jonka etuna on laaja työstöalue. Tällöin ulompi kartio toimii edullisesti staattorina ja sisempi edullisesti roottorina, johon on lisäksi kiinnitetty juoksupyörä. Juoksupyörä on kiinnitetty sopivimmin roottorina toimivaan kartioon siten, että se kääntää massan virtausta pois-
5 pois päin kartion akselista. Edullisimmin juoksupyörä on kohtisuorassa kartion akseliin nähden niin, että virtaus tapahtuu aksiaalisesti kohtisuorassa tasossa. Etuna tasomaiseen dispergaattoriin nähden kartiodispergaattorilla on se, että teräpinta-alaa voidaan nostaa 50-150 % suhteessa tasomaiseen dispergaattoriin, jolloin terän ja epäpuhtauden välisen kohtaamisen todennäköisyys nousee huomattavasti ja disper-
10 gointitehokkuus paranee.

Keksinnön mukaisessa menetelmässä dispergaattorin teräpintojen toimintaa on mahdollista säätää ja ohjata laskemalla dispergaattorin poistoalueen painetta eli poistopainetta. Dispergaattorin poistopaine on mahdollista saattaa alhaisemmaksi
15 kuin dispergaattorin poistokammion paine liittämällä dispergaattorin roottoriin juoksupyörä. Poistopaine on mahdollista laskea niin alhaiseksi, että teräalueen loppupäässä on alhaisempi paine kuin alkupäässä, jolloin syntyy imu loppupäätä kohden, jolloin vältetään ongelmilta, jotka aiheutuvat perinteisen kartiodispergaattorin siirtovoiman vähäisyydestä. Keksinnön mukaisessa menetelmässä mahdollisuus disper-
20 gaattorin tukkeutumiseen on siten vähäinen. Tästä seuraa myös, että keksinnön mukaisessa menetelmässä dispergaattorin työstöpintojen teriä voidaan asentaa tiheämpään, jolloin terien määrä kasvaa, jolloin edelleen dispergoinnin tehokkuus ja tuottavuus paranevat.

Keksinnön mukaisessa menetelmässä teräalueen syöttöpään paine eli syöttöpaine voi olla huomattavastikin alhaisempi kuin paine dispergaattorin poistokammiossa, johon juoksupyörä pumppaa massan. Tällöin poistokammion paine voidaan saattaa
25 niin korkeaksi että dispergoitu massa voidaan siirtää putkiston läpi ja dispergaattoria korkeammallekin tasolle ilman erillistä pumppua. Tällä tavoin keksinnön mukaisella menetelmällä voidaan korvata menetelmä, jossa käytetään yhdistelmää dispergaattori, pumppu, pumpun syöttötankki ja joissakin tapauksissa ruuvikuljetin. Edelleen keksinnön mukaisella menetelmällä saavutetaan dispergaattorin hyvä tehokkuus ja
30 tuottavuus, massan siirto prosessin seuraavaan vaiheeseen sekä tarvittaessa prosessin seuraavalle vaiheelle riittävä massan hydrostaattinen paine. Keksinnön mukainen menetelmä kuluttaa siis vähemmän energiaa kuin perinteiset menetelmät.
35

Hydrostaattinen paine massan pumppaamiseksi edelleen seuraavaan putkistoon voidaan tuottaa dispergaattorilla tai erillisellä pumppulaitteistolla. Dispergaattorin

poistoalueen pumppaus suoritetaan teräraon poistopäähän sijoitetulla juoksupyörällä, joita voi olla laitteessa useampia. Menetelmässä dispergointi ja pumppaus suoritetaan siis laitteen eri osissa, jolloin ne eivät haittaa toisiaan.

- 5 Keksinnön mukaisessa menetelmässä voidaan lisäksi laimentaa massa teräraon poistopäässä juoksupyörän imupuolelle syötetyn nesteen avulla. Näin massa voidaan tarvittaessa laimentaa seuraavaa prosessia varten ilman erillistä työvaihetta. Poistokammiossa on riittävä sekoitus tehokkaan laimennuksen suorittamiseksi ilman erillistä sekoituslaitetta. Tarvittava laimennusneste, joka voi olla paineistettua tai ei, 10 syötetään juoksupyörän imupuolelle syöttökanavan kautta, joita on laitteessa vähintään yksi.

- Keksinnön kohteena on edelleen dispergaattori puukuitumassan, etenkin jäte- tai keräyspaperia sisältävän massan, joka sisältää kiintoaineksen ja nestefaasin, dispergoimiseksi. Keksinnön mukainen dispergaattori käsittää terillä varustetut vastakkaiset kartiopinnat, jotka ovat saatettavissa pyörimisliikkeeseen toistensa suhteen, syöttökanavan massan johtamiseksi kiertopintojen väliseen terärakoon sekä poistokammion dispergoidun massan poistamiseksi. Dispergaattorille on tunnusomaista se, että sen teräpinnat ovat kartiomaiset ja että se käsittää lisäksi teräraon poistopäähän 20 sijoitetun juoksupyörän.

- Kuten edellä on todettu, keksinnön mukaan dispergaattorina käytetään kartiodispergaattoria, jonka etuna on laaja työstöalue. Tällöin ulompi kartio toimii edullisesti staattorina ja sisempi roottorina, johon on lisäksi kiinnitetty juoksupyörä. Juoksupyörä on kiinnitetty roottorina toimivaan kartioon sopivimmin siten, että se kääntää 25 massan virtausta pois päin kartion akselistä. Etuna tasomaiseen dispergaattoriin nähden kartiodispergaattorilla on se, että terien määrää voidaan nostaa 50-150 % suhteessa tasomaiseen dispergaattoriin jolloin terän ja epäpuhtauden välisen kohtaamisen todennäköisyys nousee huomattavasti ja dispergointitehokkuus paranee.

- 30 Kartiodispergaattorilla saavutetaan edelleen edellä mainittujen lisäksi mm. seuraavia etuja: epäpuhtauksien dispergoinnissa saavutetaan samalla tunnetulla energiatasolla korkeampi tehokkuus kuin tasomaisella dispergaattorilla; massan kuitujen katkeilu vähenee, koska energia jakaantuu suuremmalle määrälle teriä, jolloin voidaan käyttää 35 suurempaa energiaa kuin tasomaisella dispergaattorilla, kuitujen kuitenkin vahingoittumatta; dispergaattorin terien käyttöikä pitenee, koska työstöpinta-ala on laajempi ja energia/terä on alhaisempi.

Kartiodispergaattorin teräpinnat voivat olla 10-75° kulmassa kartion akseliin nähden, edullisesti 10-30° kulmassa kartion akseliin nähden. Teräpinnat voivat muodostua myös toistensa jatkeena olevista lieriö- ja kartiopinnoista, mutta terät sijaitsevat edullisesti pääasiassa kartiopinnoilla. Terät on sijoitettu liikkuvalla teräpinnalle (roottori) ja kiinteälle teräpinnalle (staattori) siten, että terät asettuvat limittäin. Terien muoto on vapaasti valittavissa, mutta niiden koon tulee olla sellainen, että roottori ja staattori muodostavat parin, jossa terät asettuvat limittäin.

Juoksupyörän virtauskanavat on suunniteltu siten, että paine kasvaa juoksupyörän ulkokehää kohden mentäessä (vrt. keskipakopumppu). Korkea paine virtauskanavissa ja niiden poistoaukoissa estää massan takaisinvirtauksen poistokammioista teräalueelle. Juoksupyörän ja poistokammion seinämän välissä on rako, joka mahdollistaa juoksupyörän vapaan liikkumisen, mutta ei massan takaisinvirtausta tai paineen alentumista poistokammiossa.

Keksintöä selostetaan seuraavassa yksityiskohtaisemmin viittamalla oheisiin piirustuksiin, joissa:

- kuvio 1 esittää erästä keksinnön mukaisen dispergaattorin sovellutusmuotoa,
- 20 kuvio 1 on osittainen pitkittäisleikkaus kyseisestä dispergaattorista,
- kuvio 2 esittää osakaaviota kuviossa 1 esitetyn dispergaattorin juoksupyörän rakenteesta ja virtauskanavista. Kuviossa on lisäksi esitetty juoksupyörän virtauskanavien toimintaperiaate. Osakaavio on poikkileikkaus kuvioon 1 merkitystä kohdasta AA, ja
- 25 kuviossa 3 esitetään kuvion 1 mukaisen dispergaattorin teräpinnan rakennetta.

Kuviossa 1 esitetty kartiodispergaattori koostuu runko-osasta, kartiosta, johon kuuluvat kartiopinnat, juoksupyörästä ja poistokammioista. Kuvion 1 osat ovat: 1 syöttöpiste; 2 kartio; 3 kartiopinnat; 4 terä; 5 terärako; 6 poistopiste; 7 juoksupyörä; 8 juoksupyörän virtauskanava; 9 poistokammio; 10 laimennusnesteen syöttökanava; 11 rako.

Puukuitumassa, joka sisältää jäte- tai keräyspaperia ja jonka sakeus on sopivasti 15-35 %, syötetään kartiodispergaattoriin syöttöpisteessä 1. Massa liikkuu kartiopinnoilla 3 terien 4 välisissä raoissa 5 edestakaisin siirtyen samalla eteenpäin kartiolla 2. Teräalueen poistopisteessä 6 syntyvä alipaine lisää massan liikkuvuutta eteenpäin kohti poistopistettä 6. Teräalueella kuitumassan epäpuhtaudet erottuvat mekaanisesti massan kuiduista, lisäksi epäpuhtaudet jauhautuvat pienemmiksi partikkeleiksi.

Massan siirtyessä teräalueen poistopisteeseen 6 se sekoittuu laimennusnesteeseen, joka syötetään poistopisteeseen 6 laimennusnesteen syöttökanavan 10 kautta. Laimennusneste voi olla paineistettua tai ei. Juoksupyörän 7 pyöriessä syntyy virtaus, jolloin massa sekoittuu laimennusnesteeseen. Pyörimisliike myös aikaansaa edellä
5 esitetyt paine-erot laitteen eri osien välillä. Laimennettu massa siirtyy juoksupyörän virtauskanavien 8 kautta kuviossa 2 esitetyn periaatteen mukaisesti poistokammioon 9. Poistokammiossa 9 massan sakeus on sopivasti 4-12 %.

Kuviossa 2 on esitetty osakaavio juoksupyörän 7 ja virtauskanavien 8 rakenteesta
10 sekä juoksupyörän virtauskanavien 8 toimintaperiaate. Osakaavio on poikkileikkaus kuvioon 1 merkitystä kohdasta AA. Juoksupyörässä 7 on aksiaalisesti ulospäin joh-
tavat virtauskanavat 8, joita rajaavat elimet 12. Massan virtaus 13 tapahtuu juoksu-
pyörän 7 akselista poispäin juoksupyörän 7 pyörimissuunnan 14 vastaiseen suun-
taan. Juoksupyörä 7 on kiinnitetty roottoriin siten, että massan virtauksen 13 suunta
15 muuttuu kartion akseliin nähden.

Juoksupyörän 7 ja poistokammion 9 seinämän välissä on rako 11, joka mahdollistaa
juoksupyörän 7 vapaan liikkumisen, mutta ei massan takaisinvirtausta tai paineen
alentumista poistokammiossa.

20 Kuviossa 3 on esitetty terien 4 sijoittelu kartiopinnalla 3. Terät voivat olla kartio-
vaippaviivojen suuntaisia tai määrättyssä kulmassa niihin nähden ja niiden muotoa ja
etäisyyttä toisistaan voidaan vapaasti vaihdella samoin kuin eri vyöhykkeiden terä-
kuvioita.

25 Alan ammattimiehelle on selvää, että keksinnön mukainen menetelmä ja laite puu-
kuitumassan dispergoimiseksi ei rajoitu edellä esitettyyn esimerkkiin vaan perustuu
seuraaviin patenttivaatimuksiin.

Patenttivaatimukset

1. Menetelmä puukuitumassan, etenkin keräyspaperia sisältävän massan, joka sisältää kiintoaineksen ja nestefaasin, dispergoimiseksi, jossa menetelmässä hienonnettu massa syötetään toistensa suhteen pyörimisliikkeeseen saatettujen dispergaattorin teräpintojen (3) väliin, tunnettu siitä, että dispergointi tapahtuu kartiopintojen (3) välisessä teräraossa (5), jonka poistopäähän (6) on järjestetty pumppuna toimiva juoksupyörä (7), jolla massa pumpataan keskipakovoiman avulla dispergaattorista ulos.
2. Patenttivaatimuksen 1 mukainen menetelmä, tunnettu siitä, että dispergaattorin sisempi kartio toimii roottorina ja ulompi kartio toimii staattorina.
3. Jonkin edellisistä patenttivaatimuksista mukainen menetelmä, tunnettu siitä, että mainittu juoksupyörä (7) on kiinnitetty roottorina toimivaan kartioon siten, että se kääntää massan virtausta poispäin kartion akselista.
4. Jonkin edellisistä patenttivaatimuksista mukainen menetelmä, tunnettu siitä, että massan laimennus teräraon (5) poistopäässä (6) suoritetaan juoksupyörän (7) imupuolelle syötetyllä nesteellä.
5. Patenttivaatimuksen 4 mukainen menetelmä, tunnettu siitä, että dispergoitavan massan sakeus ennen laimennusta on 15-35 %.
6. Patenttivaatimuksen 4 tai 5 mukainen menetelmä, tunnettu siitä, että laimennuksen jälkeen massan sakeus on 4-12 %.
7. Jonkin edellisistä patenttivaatimuksista mukainen menetelmä, tunnettu siitä, että keräyspaperia sisältävä massa dispergoidaan painomusteen ja/tai epäpuhtauksien irrottamiseksi massan kuiduista.
8. Dispergaattori puukuitumassan, etenkin keräyspaperia sisältävän massan käsittelemiseksi, joka dispergaattori käsittää terillä varustetut vastakkaiset työstöpinnat (2), jotka ovat saatettavissa pyörimisliikkeeseen toistensa suhteen, syöttökanavan (1) massan johtamiseksi teräpintojen väliseen terärakoon sekä poistokammion (6) dispergoidun massan poistamiseksi, tunnettu siitä, että sen teräpinnat (2) ovat kartiomaiset ja että se käsittää lisäksi teräraon poistopäähän sijoitetun juoksupyörän (3).

9. Patenttivaatimuksen 8 mukainen dispergaattori, tunnettu siitä, että se käsittää yhden tai useamman laimennusnesteen syöttökanavan (7).
- 5 10. Patenttivaatimuksen 8 tai 9 mukainen dispergaattori, tunnettu siitä, että kartiopinta muodostaa 10-75° kulman kartion akseliin nähden, edullisesti 10-30° kulman kartion akseliin nähden.
- 10 11. Jonkin patenttivaatimuksen 8-10 mukainen dispergaattori, tunnettu siitä, että terät (9) on sijoitettu sanotuille kartiopinnoille niin, että ne asettuvat limittäin.
12. Jonkin patenttivaatimuksen 8-11 mukainen dispergaattori, tunnettu siitä, että laitteen teräpinnat muodostuvat toistensa jatkeena olevista lieriö- ja kartiopinnoista.

(57) Tiivistelmä

Keksinnön kohteena on menetelmä ja laite puukuitumassan, etenkin keräyspaperia sisältävän massan, dispergoimiseksi, jossa hienonnettu massa syötetään toistensa suhteen kiertoliikkeeseen saatettujen dispergaattorin teräpintojen (3) väliin. Keksinnölle on tunnusomaista se, että dispergointi tapahtuu kartiopintojen (3) välisessä teräraossa (5), jonka poistopäähän (6) on järjestetty pumppuna toimiva juoksupyörä (7), jolla massa pumpataan keskipakovoiman avulla dispergaattorista ulos. Dispergaattorin sisempi kartio voi toimia roottorina ja ulompi kartio voi toimia staattorina. Massan voidaan lisäksi laimentaa juoksupyörän (7) imupuolelle syötetyllä nesteellä teräraon (5) poistopäässä.

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 03 OCT 2001

WIPO PCT

14

| | | |
|---|---|--|
| Applicant's or agent's file reference BP100192/MAK/PKK | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/FI00/00804 | International filing date (day/month/year) 21.09.2000 | Priority date (day/month/year) 21.09.1999 |
| International Patent Classification (IPC) or national classification and IPC ₇ B 02 C 7/00, D 21 D 1/30 | | |
| Applicant VALMET MECHANICAL PULPING OY et al | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

| | |
|--|--|
| Date of submission of the demand 19.04.2001 | Date of completion of this report 04.09.2001 |
| Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88 | Authorized officer Wiva Asplund/ELY Telephone No. 08-782 25 00 |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00804

I. Basis of the report

1. With regard to the elements of the international application:*

- ☒ the international application as originally filed
- ☐ the description:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the claims:
 pages _____, as originally filed
 pages _____, as amended (together with any statement) under article 19
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the drawings:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item. These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00804

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|--------|-------------|-----|
| Novelty (N) | Claims | <u>1-12</u> | YES |
| | Claims | _____ | NO |
| Inventive step (IS) | Claims | <u>1-12</u> | YES |
| | Claims | _____ | NO |
| Industrial applicability (IA) | Claims | <u>1-12</u> | YES |
| | Claims | _____ | NO |

2. Citations and explanations (Rule 70.7)

The documents cited in the International Search Report represent the prior art. The claimed invention stated in claims 1-12 is not considered to be anticipated by these documents. None of the documents or any relevant combination of them reveal a method or a device for dispersing pulp with a running wheel acting as pump arranged at the outlet end of a narrow opening between conical surfaces, where the dispersing event takes place as described by these claims.

According to the arguments stated above, the invention claimed in claim 1-12 is novel, considered to involve an inventive step and have industrial applicability.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/FI00/00804

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

On line 7 in claim 1 the word "blade" must be added between "conical" and "surface".

In claim 8, line 38, the reference sign "3" must be changed to "7". In claim 9, line 2, "7" must be changed to "10" and in claim 11, line 9, "9" must be changed to "4".

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00804

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B02C 7/00, D21D 1/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B02C, D21B, D21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| A | SE 441758 B (SUNDS DEFIBRATOR AB), 4 November 1985 (04.11.85), page 1, line 36 - page 2, line 11, figure 1 -- | 1,8 |
| A | EP 0931584 A1 (VOITH SULZER PAPIERTECHNIK PATENT GMBH), 28 July 1999 (28.07.99), column 3, line 5 - line 37, figure 1 -- ----- | 1,8 |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

27 December 2000

Date of mailing of the international search report

09-01-2001

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INTERNATIONAL SEARCH REPORT
Information on patent family members

04/12/00

International application No.
PCT/FI 00/00804

| Patent document cited in search report | | | Publication date | Patent family member(s) | | Publication date |
|---|---------|----|---------------------|----------------------------|------------|---------------------|
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| | | | | DE | 207937 T | 30/04/87 |
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| | | | | WO | 8504433 A | 10/10/85 |
| <hr/> | | | | | | |
| EP | 0931584 | A1 | 28/07/99 | DE | 19802260 A | 29/07/99 |
| <hr/> | | | | | | |

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



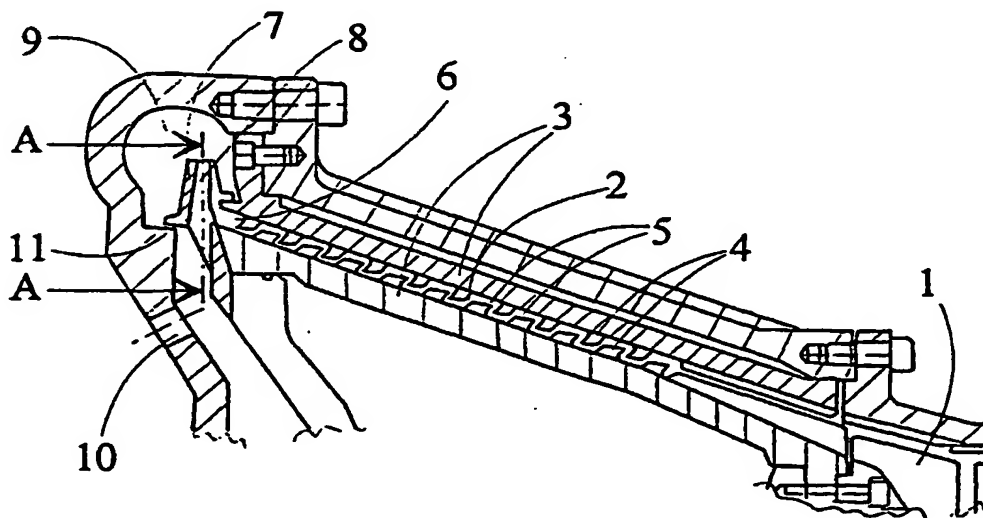
(43) International Publication Date
29 March 2001 (29.03.2001)

PCT

(10) International Publication Number
WO 01/21312 A1

- (51) International Patent Classification⁷: B02C 7/00, (74) Agent: BERGGREN OY AB; P.O. Box 16, FIN-00101 Helsinki (FI).
D21D 1/30
- (21) International Application Number: PCT/FI00/00804 (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: 21 September 2000 (21.09.2000)
- (25) Filing Language: Finnish
- (26) Publication Language: English
- (30) Priority Data: 19992010 21 September 1999 (21.09.1999) FI (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant (*for all designated States except US*): VALMET MECHANICAL PULPING OY [FI/FI]; P.O. Box 125, FIN-37601 Valkeakoski (FI).
- (72) Inventor; and
- (75) Inventor/Applicant (*for US only*): KANKAANPÄÄ, Veikko [FI/FI]; Rengastie 24 B, FIN-37600 Valkeakoski (FI).
- Published:
— With international search report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND DEVICE FOR PROCESSING PULP



(57) Abstract: The object of the invention is a method and a device for dispersing pulp, especially pulp containing waste paper, in which method ground pulp mass is fed between the blade surfaces (3) of a dispersing device that are brought in a rotating movement in relation to one another. The invention is characterized in that the dispersing event takes place in a narrow opening (5) between the conical surfaces (3) at the outlet end (6) of which there is arranged a running wheel (7) acting as pump by which the pulp is pumped out of the dispersing device by centrifugal force. The inner cone of the dispersing device may act as rotor and the outer cone may act as stator. In addition, the pulp may be diluted at the outlet end of the blade opening (5) with fluid introduced to the intake side of the running wheel (7).

WO 01/21312 A1

Method and Device for Processing Pulp

The object of this invention is a method for dispersing pulp, especially pulp containing waste paper, that contains solid material and a liquid phase in which method ground pulp mass is fed between the blade surfaces of a dispersing device that are brought in a rotating movement in relation to one another. An object of the invention is also a dispersing device for applying the aforementioned method.

Pulp is treated in a dispersing device where the impurities of the pulp are separated from the fibers that are nevertheless not damaged in the treatment. This may be accomplished with the aid of mutually opposed blade equipped blade surfaces of the dispersing device of which blade surfaces one along with its base (stator) is fixed and the other blade surface along with its base (rotor) is rotating in relation to the other blade surface. The blades and the narrow openings between them cause the pulp move back and forth in the dispersing device, whereby separation of impurities from the fibers is accomplished. The purpose of dispersing is usually mechanical release of impurities from the fibers and simultaneously the grinding of impurities into smaller particles without nevertheless negatively affecting the properties of the fibers.

A dispersing device especially well suited for treatment of pulp mass containing waste paper that contains ink particles or impurities such as adhesives and melt or fusion coatings. A method and dispersing device intended to treatment of this kind of pulp is presented in Patent Publication SE 502 906. In the publication there is presented a grinding element that consists of two mutually opposed grinding disks that are equipped with elevated indents. The inclined elevated patterns are arranged radially on the disks.

In addition to the planar dispersing devices even cone-shaped dispersing devices may be used. However, the problem with the conical dispersing devices is the small amount of mass transferring power allowed by them. Therefore when the pressure in the outlet chamber is high, that is, in the openings between the indents the thrust is high, adjusting the working faces becomes more difficult and the load of the dispersing device increases. The dispersing device may even become clogged, whereby the process is interrupted. This problem is avoided by using the inventive method.

In the method according to the invention pulp, especially pulp containing waste paper, is dispersed in a blade opening between cone-shaped surfaces to the outlet end of which is arranged a running wheel acting as a pump by which the pulp is pumped with the aid of centrifugal force out of the dispersing device.

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In the method according to the invention a conical dispersing device is used, the advantage of which is a wide working area. Hereby the outer cone preferably acts as stator and the inner cone preferably acts as rotor, onto which is additionally fixed a running wheel. The running wheel is most suitably fixed onto the cone acting as rotor such that it diverts the flow of mass away from the axis of the cone. Most preferably the running wheel is perpendicular to the axis of the cone such that the flow is in a perpendicular plane with regard to the axis. The advantage of a conical dispersing device in regard to a planar dispersing device lies in that blade surface area may be raised 50-150% in relation to a planar dispersing device, whereby the probability of the blade meeting an impurity increases considerably and the efficiency of the dispersing event is improved.

In the method according to the invention the function of the blade surfaces of the dispersing device may be adjusted and regulated by decreasing the pressure in the outlet area of the dispersing device, that is the outlet pressure of the device. The outlet pressure of the dispersing device may be adjusted lower than the pressure in the outlet chamber of the dispersing device by connecting a running wheel onto the rotor of the dispersing device. It is possible to decrease the outlet pressure to such a low value that the pressure at the end of the blade area is lower than in the beginning of the blade area, where by suction is created towards the end area, whereby problems arising due to the low transferring power of the traditional cone-shaped dispersing device are avoided. When using the inventive method the probability of clogging of the dispersing device is thus low. From the above it follows even that when using the inventive method the blades of the working surfaces of the dispersing device may be mounted at closer distances to one another, whereby the number of the blades is increased, whereby further the efficiency and productivity of the dispersing event are improved.

In the inventive method the pressure at the inlet of the blade area, that is the inlet pressure, may be even considerably lower than the pressure in the outlet chamber of the dispersing device, into which the running wheel pumps the pulp. Hereby the pressure in the outlet chamber may be raised to such a high level that the pulp once dispersed may be transferred through the piping and to an even higher level than the

dispersing device without a separate pump. In this way the inventive method can replace a method, in which a combination of a dispersing device, a pump, a feed tank for the pump and in some cases a screw conveyor is used. Further by the method according to the invention a high efficiency and productivity of the dispersing device are accomplished along with transfer of the pulp to the next stage of the process as well as if need may be, a hydrostatic pressure of the pulp that is sufficiently high for the next stage of the process. Thus the inventive method has a lower energy consumption than traditional methods.

- 10 The hydrostatic pressure for pumping of the pulp further to the next piping can be produced with the dispersing device or with a separate pumping equipment. Pumping in the outlet area of the dispersing device is accomplished with the aid of a running wheel situated at the outlet end of the blade opening and of which there may be several in the device. In the method dispersing and pumping are thus realized in
15 separate parts of the device, whereby they don't interfere with each other.

- In the method according to the invention pulp may be in addition diluted at the outlet end of the blade opening with fluid introduced to the intake side of the running wheel. Thus the pulp may be diluted for the next process, if need may be, without a
20 separate work stage. In the outlet chamber mixing is sufficient to cause efficient dilution without a separate mixing means. The dilution fluid that may be pressurized or not, is introduced to the intake side of the running wheel through a feed channel of which there is at least one in the device.

- 25 Also, an object of the invention is a dispersing device for dispersing pulp, especially pulp containing waste paper, that contains solid material and a liquid phase. The dispersing device according to the invention comprises mutually opposed conical surfaces equipped with blades which may be brought in a rotating movement in relation to one another, an inlet channel for introducing pulp into the blade opening
30 between the rotating surfaces as well as an outlet chamber for removal of the dispersed pulp. The dispersing device is characterized in that its blade surfaces are conical and that it comprises in addition a running wheel situated at the outlet end of the blade opening.

- 35 As stated above, according to the invention a conical dispersing device is used as dispersing equipment, the advantage of which is a wide working area. Hereby the outer cone preferably acts as stator and the inner cone preferably acts as rotor, onto which is additionally fixed a running wheel. The running wheel is most suitably

fixed onto the cone acting as rotor such that it diverts the flow of mass away from the axis of the cone. The advantage of a conical dispersing device in regard to a planar dispersing device lies in that the number of blades may be raised 50-150% in relation to a planar dispersing device, whereby the probability of the blade meeting an impurity increases considerably and the efficiency of the dispersing event is improved.

Further in addition to the above, the following advantages among others are realized by a conical dispersing device: in dispersing impurities higher efficiency than with a planar dispersing device is realized by the same known energy level; breaking of pulp fibers is reduced because energy is distributed on a greater number of blades, whereby a higher energy level than with a planar dispersing device may be used without nevertheless damaging the fibers; the service life of the blades of the dispersing device is increased because the working surface area is larger and hence the relation energy/blade lower.

The blade surfaces of a conical dispersing device may be at an angle of 10-75° in relation to the axis of the cone, preferably at an angle of 10-30° in relation to the axis of the cone. The blade surfaces may also consist of cylindrical surfaces and conical surfaces that are in extension to one another, however, it is preferred that the blades are mainly situated on conical surfaces. The blades are arranged on the moving blade surface (rotor) and on the fixed blade surface (stator) such that the blades are overlapping one another. The shape of the blades may be chosen at will, but their size must be such that the rotor and the stator form a pair in which the blades overlap.

The flow channels of the running wheel are designed such that the pressure increases towards the outer circumference of the running wheel (cf. a centrifugal pump). A high pressure in the flow channels and at their outlet openings stops the pulp from flowing back from the outlet chamber to the blade area. Between the running wheel and the outlet chamber wall there is a narrow opening that makes it possible for the running wheel to move freely but not for the pulp to flow back or for the pressure to drop in the outlet chamber.

The invention is explained more in detail in the following with regard to the appended drawings in which:

Fig. 1 presents an embodiment of the dispersing device according to the invention, Fig. 1 is a partial longitudinal section of the aforementioned dispersing device,

Fig. 2 presents a partial scheme of the structure and flow channels of the running wheel of the dispersing device presented in Fig. 1. Fig. 2 shows in addition the principle of the flow channels of the running wheel. The partial scheme is a cross section of the plane marked AA in Fig. 1, and

Fig. 3 presents the structure of the blade surface of the dispersing device according to Fig. 1.

10 The conical dispersing device presented in Fig. 1 consists of a body part, a cone that includes the conical surfaces, of a running wheel and of an outlet chamber. The components in Fig. 1 are: 1 a feed point; 2 a cone; 3 conical surfaces; 4 a blade; 5 a blade opening; 6 an outlet point; 7 a running wheel; 8 a flow channel of the running wheel; 9 an outlet chamber; 10 a feed channel of the dilution fluid; 11 a narrow opening.

The pulp that contains waste paper and the density of which is suitably 15-35%, is introduced to the conical dispersing device at the feed point 1. The pulp moves back and forth on the conical surfaces 3 in the narrow openings 5 of the blades 4 while it is simultaneously transferred forwards on the cone 2. The negative pressure created at the outlet point 6 of the blade area increases the mobility of the pulp forwards towards the outlet point 6. In the blade area impurities of the pulp are separated mechanically from the fibers of the pulp, in addition to which the impurities are ground into smaller particles.

25 As the pulp moves on to the outlet point 6 of the blade area it is blended with the dilution fluid that is introduced to the outlet point 6 through a feed channel 10 for the dilution fluid. The dilution fluid may be pressurized or not. As the running wheel 7 revolves a flow is created and the pulp is blended in the dilution fluid. The revolving motion also accomplishes the differing pressures between various parts of the device mentioned above. The diluted pulp is transferred through flow channels 8 of the running wheel according to the principle presented in Fig. 2 to the outlet chamber 9. In the outlet chamber 9 the density of the pulp is suitably 4-12%.

35 In Fig. 2 is presented a partial scheme of the structure of the running wheel 7 and of the flow channels 8 as well as the principle of the flow channels 8 of the running wheel. The partial scheme is a cross section of the plane marked AA in Fig. 1. The running wheel 7 has flow channels 8 that protrude axially outwards and are outlined

by organs 12. The flow of pulp 13 is away from the axis of the running wheel 7 in a direction opposite to the direction of rotation 14 of the running wheel 7. The running wheel 7 is mounted on the rotor in such a way that the direction of the flow of mass 13 changes in relation to the axis of the cone.

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Between the running wheel 7 and the wall of the outlet chamber 9 there is a narrow opening 11 that makes it possible for the running wheel 7 to move freely but not for the pulp to flow backwards or for the pressure to decrease in the outlet chamber.

10 In Fig. 3 is presented the arrangement of the blades 4 on the conical surface 3. The blades may be parallel with the conical surface lines or at a certain angle thereto, and their shape and mutual distance may be varied at will, as may be the blade patterns in various zones.

15 To the one skilled in the art it is obvious that the inventive method and the inventive device for dispersing pulp are not limited to the example presented above while they are based on the following claims.

Claims

1. A method for dispersing pulp, especially pulp containing waste paper, that contains solid material and a liquid phase, in which method ground pulp mass is fed
5 between the blade surfaces (3) of a dispersing device that are brought in a rotating movement in relation to one another, characterized in that the dispersing event takes place in a narrow opening (5) between the conical surfaces (3), at the outlet end (6) of which there is arranged a running wheel (7) acting as pump by which the pulp is pumped out of the dispersing device by centrifugal force.
- 10 2. A method according to claim 1, characterized in that the inner cone of the dispersing device acts as rotor and the outer cone acts as stator.
3. A method according to one of the preceding claims, characterized in that
15 said running wheel (7) is fixed on the cone acting as rotor in such a way that it diverts the flow of mass away from the axis of the cone.
4. A method according to one of the preceding claims, characterized in that the
20 dilution of pulp at the outlet end (6) of the blade opening (5) is accomplished by fluid introduced to the intake side of the running wheel (7).
5. A method according to claim 4, characterized in that the density of the pulp to be dispersed is before dilution 15-35%.
- 25 6. A method according to claim 4 or claim 5, characterized in that the density of the pulp is after dilution 4-12%.
7. A method according to one of the preceding claims, characterized in that the
30 pulp containing waste paper is dispersed in order to release printing ink and/or impurities from the fibers of the pulp.
8. A dispersing device for processing pulp, especially pulp containing waste paper, the dispersing device comprising mutually opposed working surfaces (2) fitted with blades that may be brought into a revolving motion in relation to one another, a feed channel (1) for introducing pulp to the blade opening between the
35 blade surfaces as well as an outlet chamber (6) for removal of the dispersed pulp, characterized in that its blade surfaces (2) are conical and that it comprises additionally a running wheel (3) situated at the outlet end of the blade opening.

9. A dispersing device according to claim 8, characterized in that it comprises one or more feed channels (7) for the diluting fluid.

5 10. A dispersing device according to claim 8 or claim 9, characterized in that the conical surface is at a 10-75° angle to the axis of the cone, preferably at a 10 - 30° angle to the axis of the cone.

10 11. A dispersing device according to one of claims 8 - 10, characterized in that the blades (9) are arranged on said conical surfaces such that they overlap.

12. A dispersing device according to one of claims 8 - 11, characterized in that the blade surfaces of the device consist of cylindrical surfaces and conical surfaces that are in extension to one another.

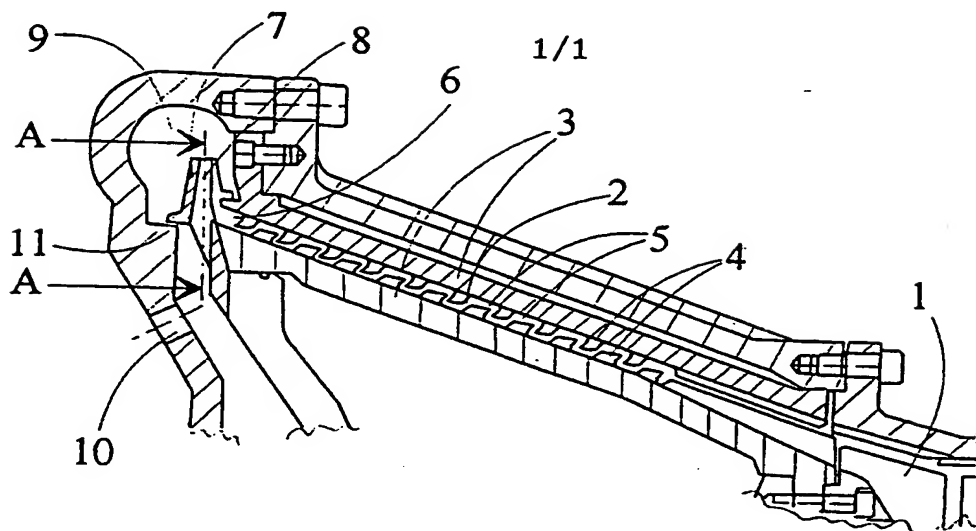


Fig.1

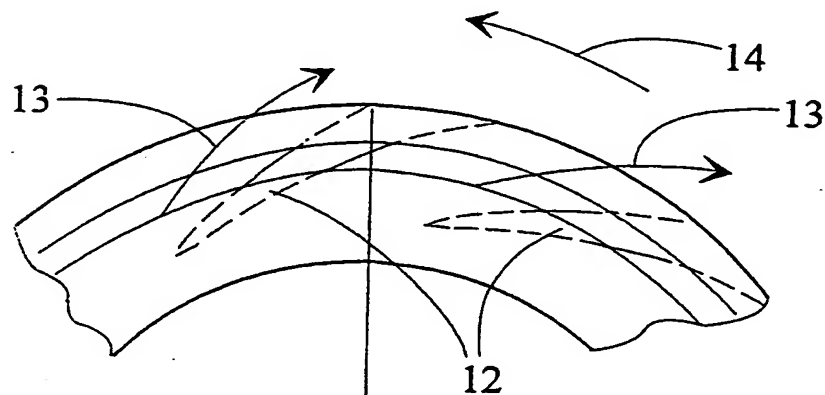


Fig.2

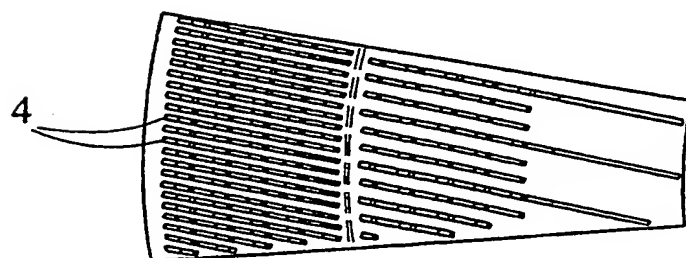


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00804

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B02C 7/00, D21D 1/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B02C, D21B, D21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
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| A | EP 0931584 A1 (VOITH SULZER PAPIERTECHNIK PATENT GMBH), 28 July 1999 (28.07.99), column 3, line 5 - line 37, figure 1 -- ----- | 1,8 |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT
Information on patent family members

04/12/00

International application No.
PCT/FI 00/00804

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| Patenttivirastojen julkaisut FI, SE, NO, DK, DE, CH, EP, WO, GB, US: D21D1/00-1/40, B02C2,7 | |
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| Muu aineisto | |
| Käsi- ja lehtiartikkeleita, esitteitä Tietokonehaku EPO QUE, vv-75-2000 Tietokonehaku Cdrom (RU), (AU), vv 76--99 | |
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| VIITEJULKAISUT | | |
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| Kategoria*) | Julkaisun tunnistetiedot | Koskee vaatimuksia |
| A | EP A 886001 D21D1/30 | |
| A | EP A 922495 B02C7/12 | |
| Y | Wochenblatt 1:1976, pp3-37 | 6 |
| A | Bellwood Machinery, Nässjö, Sweden. Krima Disperser Type KD | |
| | | <input type="checkbox"/> jatkuu kääntöpuolella |
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| Paiväys 2.6.2000 | Tutkija Antero Suurhella | |